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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

RAO, SHRINIVAS H

ART UNIT PAPER NUMBER

2814

DATE MAILED: 03/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/074,534

Applicant(s)

TODD, MICHAEL A.

Examiner

Steven H. Rao

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 27 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) 16-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-15 and 20-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 11 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7 6) ☐ Other _____

DETAILED ACTION

Priority

Receipt is acknowledged of paper submitted under 35 U.S.C. 119(e) from provisional U.S. Patent Application Numbers 60/268,337 filed on February 12, 2001; 60/279,256 filed on March 27, 2001; 60/311,609 filed on August 9, 2001; 60/323649 filed on September 19, 2001; 60/332,696 filed on November 11, 2001; 60/333,724 filed on November 28, 2001 and 60/340,454 filed on December 07, 2001 which papers have been placed of record in the file.

Drawings

The drawings filed on 02/11/02 have been accepted by the Draftsperson.

Information Disclosure Statement

Acknowledgment is made of receipt of applicant's Information Disclosure Statement (PTO-1449) filed on May 14, 2002.

The references on PTO 1499 submitted on 05/14/2002 are acknowledged. All the cited references have been considered. However the foreign patents and documents cited by applicant are considered to the extent that could be understood from the abstract and drawings.

Preliminary Amendment Status

Acknowledgment is made of entry of preliminary amendment filed 04/15 / 2002.

Therefore claims 1 and 20 as recited in the preliminary amendment and claims 2-15 and 21-33 as originally filed are currently pending in the application.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 20 to 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 20 the phrase "a deposition gas comprising amounts of trisilane and a germanium precursor that are varied during deposition" renders the claim indefinite.

It is not clear what applicants' intend to include/exclude by the above recitation. Further the specification, prior art or knowledge of one of ordinary skill in the art does not clarify what the applicants' intend to include/exclude by the above expression "amounts".

Claims 21 to 33 are rejected for at least depending upon a rejected claim 20.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 to 15, and 20 to 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rolfson (U.S. Patent No. 5,786, 027, herein after Rolfson, also cited by the applicants' in their IDS) in view of U'Ren (U.S. Patent No 6,3665,479 herein after U'Ren).

With respect to claim 1, Rolfson describes a process for depositing a non-single crystalline Si- Ge –containing material on to a surface, including : providing a chemical vapor deposition chamber having disposed therein a substrate, (Rolfson abstract lines 2-3), introducing a gas comprised of a higher-order silane (Rolfson col. 4 lines 11-14).

Rolfson does not specifically describe introducing a germanium precursor to the chamber and depositing a non-single crystalline SiGe containing film onto the substrate.

However U'Ren in figure 1 and col. 3 lines 50 to 60 describes introducing a germanium precursor to the chamber and depositing a non-single crystalline SiGe containing film onto the substrate to provide a process that achieves the desired pre-determined profile that can be controlled in order to produce a multi layer stack with the desired profile (eg. devices with better gain, speed and frequency response).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include U'Ren's step of introducing a germanium precursor to the chamber and depositing a non-single crystalline SiGe containing film onto the substrate in Rolfson's method to provide a process that achieves the desired predetermined profile that can be controlled in order to produce a multi layer stack with the desired profile (eg. devices with better gain, speed and frequency response).

With respect to claim 2, wherein the higher-order silane is selected from the group consisting of disilane, trisilane and tetrasilane. (Rolfson col. Col.4 lines 11-14).

With respect to claim 3, wherein the germanium precursor is selected from the group consisting of germane, digermane, trigermane and tetragermane. (U'Ren col. 3 line 52).

With respect to claim 4, wherein the higher -order silane is trisilane and the germanium precursor is germane. .(Rolfson col. Col.4 lines 11-14 and U'Ren col. 3 line 52).

With respect to claim 5, wherein the non-single crystalline SiGe – containing film is polycrystalline and depositing is carried out at a temperature of 550 to 700 ° C. (U'Ren fig. 3, Rolfson col. 4 line 6)

With respect to claim 6, wherein the non-single crystalline SiGe – containing film is polycrystalline and depositing is carried out at a temperature of 450 to 600 ° C. (U'Ren fig. 3, Rolfson col. 4 line 6).

With respect to claims 7 and 8, wherein the deposition is carried out at the rate of 50 or 100 Angstroms per minute. (Rolfson col. 5 lines 30-31).

With respect to claim 9, wherein gas further comprises one or more compounds selected from the group of monosilylmethane, disilylmethane, trisilylmethane, tetrasilylmethane and a dopant precursor. (Rolfson col. 4 lines 34-54).

With respect to claim 10, wherein the CVD chamber is a single-wafer horizontal gas flow reactor. (Rolfson col. 1 lines 44-56).

With respect to claims 11 and 12, wherein the SiGe containing film has a thickness non-uniformity of about 10 % or less and wherein the film made with higher – order silane has greater uniformity than that made by silane. (U'Ren graph 3).

With respect to claim 13, wherein the SiGe containing film is patterned to form a transistor gate electrode (U'Ren abstract lines 5).

With respect to claims 14 and 15 wherein the surface is formed by a dielectric film or silicon oxide film (U'Ren fig.1 # 110, col. 4 lines 3-4).

With respect to claim 20, to the extent understood, Rolfson describes a process for depositing a non-single crystalline Si- Ge –containing material on to a surface, including: providing a substrate disposed within a chemical vapor deposition chamber (Rolfson abstract lines 2-3)

Rolfson does not specifically describe depositing a graded Si Ge-containing film onto the substrate by thermal CVD using a deposition gas comprising amounts of trisilane and a germanium precursor that are varied during deposition.

However U'Ren in figure 1 and col. 3 lines 50 to 60, col. 4 lines 18-21, col.5 lines 20-22 describes introducing a graded Si Ge-containing film onto the substrate by thermal CVD using a deposition gas comprising amounts of trisilane and a germanium

precursor that are varied during deposition to provide a process that achieves the desired pre-determined profile that can be controlled in order to produce a multi layer stack with the desired profile (eg. devices with better gain, speed and frequency response).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include U'Ren's step of introducing a graded Si Ge-containing film onto the substrate by thermal CVD using a deposition gas comprising amounts of trisilane and a germanium precursor that are varied during deposition in Rolfson's method to provide a process that achieves the desired pre-determined profile that can be controlled in order to produce a multi layer stack with the desired profile (eg. devices with better gain, speed and frequency response).

With respect to claim 21 wherein the amounts are varied to produce a germanium concentration that is substantially linear function of the amount of germanium precursor. (U'Ren figure 2).

With respect to claim 22 wherein the germanium precursor is selected from germane and digermane (U'Ren col. 3 line 52).

With respect to claim 23, wherein the graded SiGe containing film is deposited at a deposition rate that is a substantially linear function of the amount of germanium precursor (U'Ren figure 3).

With respect to claim 24, wherein the deposition gas contains silane (Rolfson col. 4 lines 11-20, 40-54).

With respect to claim 25, wherein the amount of silane is varied during deposition. (U'Ren figure 2, Rolfson col. 4 lines 50-55).

With respect to claims 26 and 27, wherein the weight ratio of trisilane to silane in the deposition gas is 1:1 or greater or 4:1 or greater. (U'Ren figure 2, Rolfson col. 4 lines 50-55).

With respect to claim 28 wherein the SiGe containing film is epitaxial. (U'Ren col.1 line 67)

With respect to claim 29 wherein the SiGe containing film includes carbon. (U'Ren figure 1, col. 4 line 7).

With respect to claim 30 wherein the SiGe containing film is polycrystalline. (U' Ren col. 8 line 47).

With respect to claim 31 wherein the SiGe containing film is amorphous. (U'Ren col. 10 line 12).

With respect to claim 32 wherein the SiGe containing film is formed directly over the dielectric (U'Ren figure 1).

With respect to claim 33 wherein the dielectric film is silicon dioxide. (U' Ren fig.1 and col. 4 line 7).

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Steven H. Rao whose telephone number is (703) 306-5945. The examiner can normally be reached on Monday- Friday from approximately 7:00 a.m. to 5:30 p.m.

Application/Control Number: 10/074,534

Page 9

Art Unit: 2814

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. The Group facsimile number is (703) 308-7722.



Steven H. Rao

Patent Examiner

March 18, 2003.

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